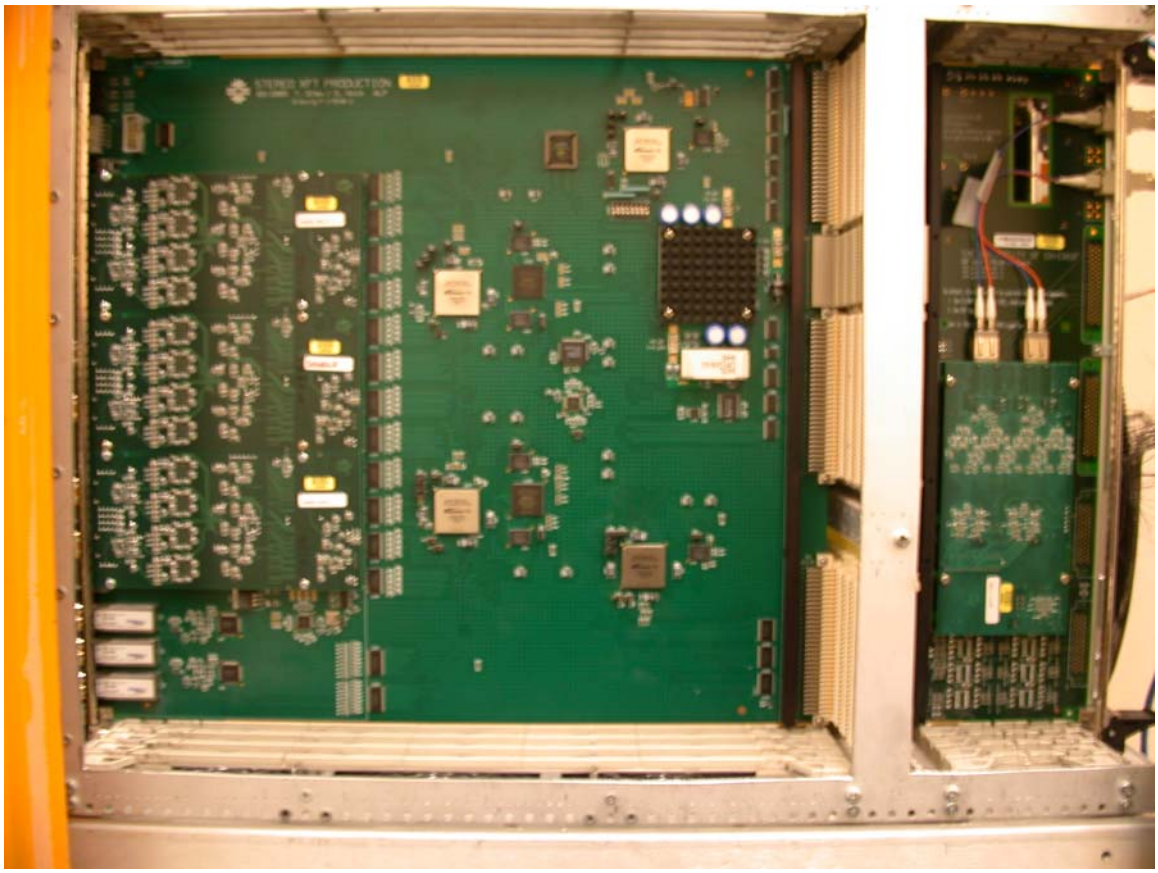
TX & RX Mezzanine board - PROGRAMMING and TESTING
SH 11/22/2006

http://www-ppd.fnal.gov/tshaw.myweb/RX_Mezz.html
http://www-ppd.fnal.gov/tshaw.myweb/TX_Mezz.html

The TX and RX mezzanine boards are tested by sending a fixed pattern from an FPGA(L2-Pulsar) on the Stereo Finder board through a **TX Mezzanine board** sitting on a transition module and then receiving the data via an **RX Mezzanine board** located on the same Stereo Finder board. Either the TX or RX board can be the unit being tested. The received data is captured in a FPGA(Finder A) on the Stereo Finder. The data captured is then read out via the VME bus and compared to the pattern being transmitted, mismatches are recorded as errors. The pattern is such that all bits associated with the driving and receiving of data on the TX and RX board are exercised.



The software for running the test routine was written by Rod Klein of Fermilab. The routine is written in C code and is located in the CDF repository in the sxft/sxft_v3 directory. The routine is accessed via the SXFT_V3 advanced test menu. The testing routine will be detailed at the end of this document.

After assembly of the mezzanine boards the Xilinx PLD's on the TX or RX boards will need to be programmed. The files for the programming are located at: _____ and will also be burned to the TX/RX Mezzanine information CD. The file name for the

single design is labeled as RX_MEZZ_Single.ipf and RX_MEZZ_Double.ipf for the double design, the file name for the TX board is TX_Mezz.ipf. The firmware designs that were used to create the programming files are located in the same directory and will also be burned to the information CD. The firmware was designed using the "XILINX ISE 7.1i" software.

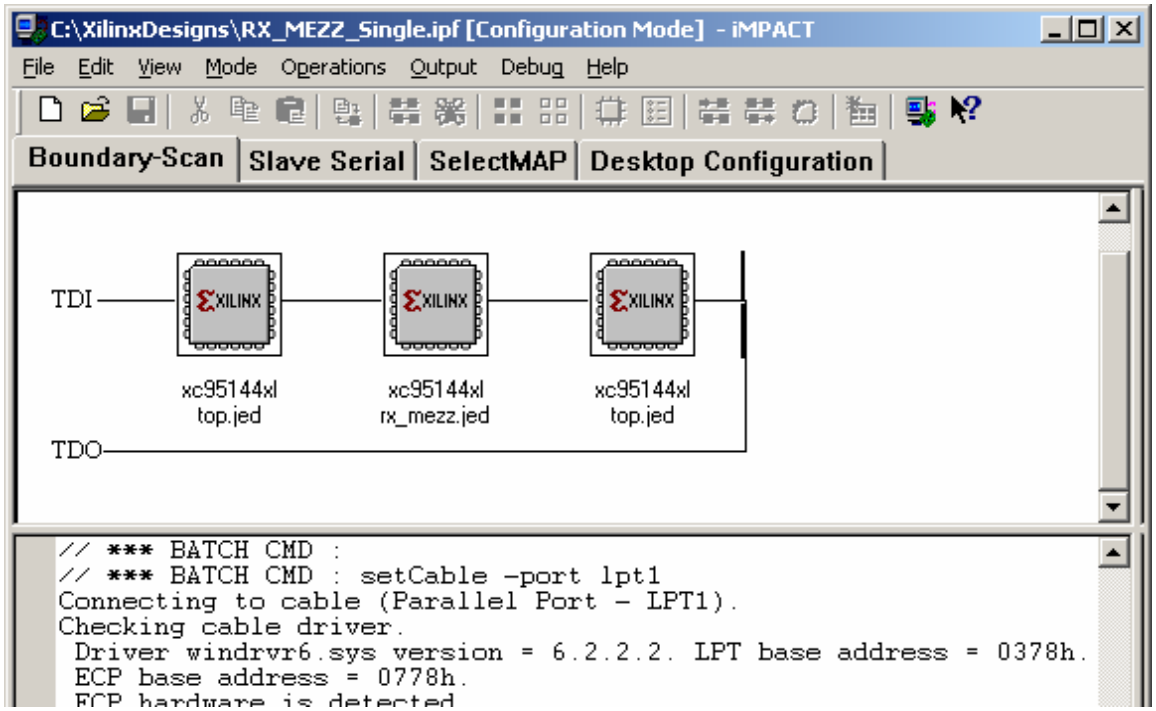
The PLD's located on the RX Mezzanine boards that are mounted on the Stereo Finder can be programmed with two different designs, the first design sends the data from all 4 fibers to the 4 outputs(Top fiber to the 1st output, 2nd fiber to the 2nd output, etc.), this is called the single design. The second design sends the data from top fiber to outputs 1 and 2 and data from fiber 3 to outputs 3 and 4, this design is called the double design. With the double design ports 2 and 4 are not used. The double design is used in the middle RX board location on the Stereo Finder board for duplicating neighbor data to the two different Finder FPGA's.

The RX boards that will be loaded with the "Double" design should be tested with the single design before they are reprogrammed with the "Double" design.

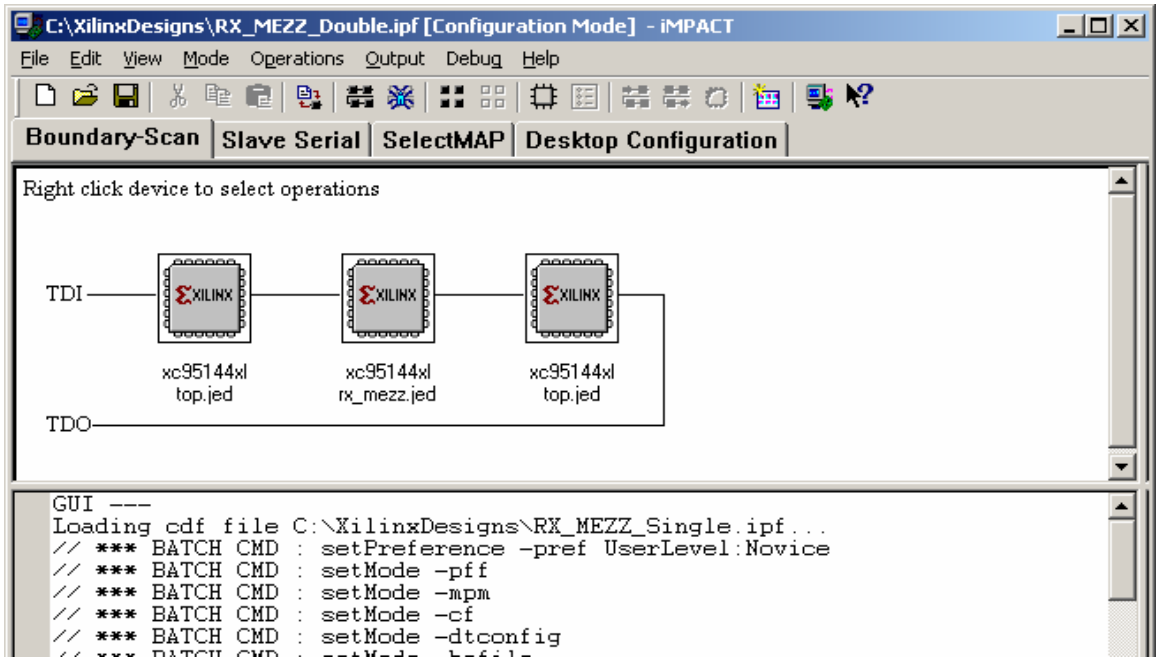
RX Mezzanine board

Routine for programming the <u>RX Mezzanine</u> board:

Invoke the XILINX Impact software which is used for programming the PLD's, the current version is 7.1.04i. Load the programmer file, the window should show three devices in the chain and a file associated with each. A screen shot of the programmer window for the single design is shown below followed by a screen shot for the "Double" design.



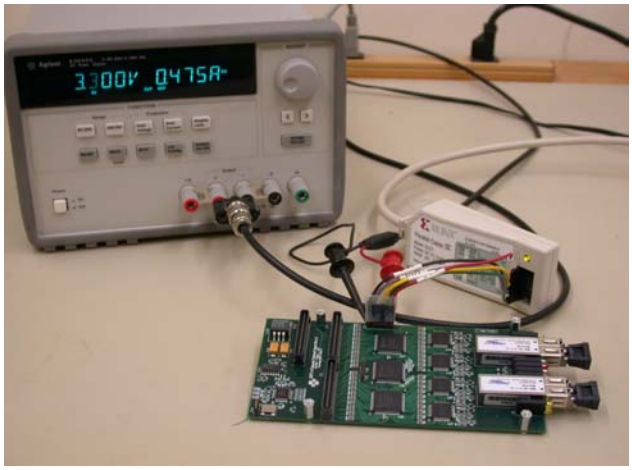
The two different design's programming windows look very similar because the top level designs have the same names but originate in different projects. The top.jed file for the single and double design are different, the rx_mezz.jed file is the same for both designs.



Connect the Xilinx Paralell Cable IV programmer Model# DLC7 to the parallel port of the PC and the DC converter associated with the programmer to the wall outlet. With it's output disabled or off connect a 3.3v power supply to the RX board J17 connector - ground to pin #1 and +3.3v to pin # 6(turn the power supply on after the programmer wires are connected). Connect the programmer wires to the same J17 connector on the RX board. Connect the programmer wires to the correct pins of the header:

Pin 1 = Gnd
Pin 2 = TDO
Pin 3 = TDI
Pin 4 = TCK
Pin 5 = TMS
Pin 6 = +3.3v

Enable the power supply output. Select all three devices using the "select all" button in the middle row of buttons in the programmer window. Right click the mouse in the main window and select program all.



Programmer, Power Supply & RX board

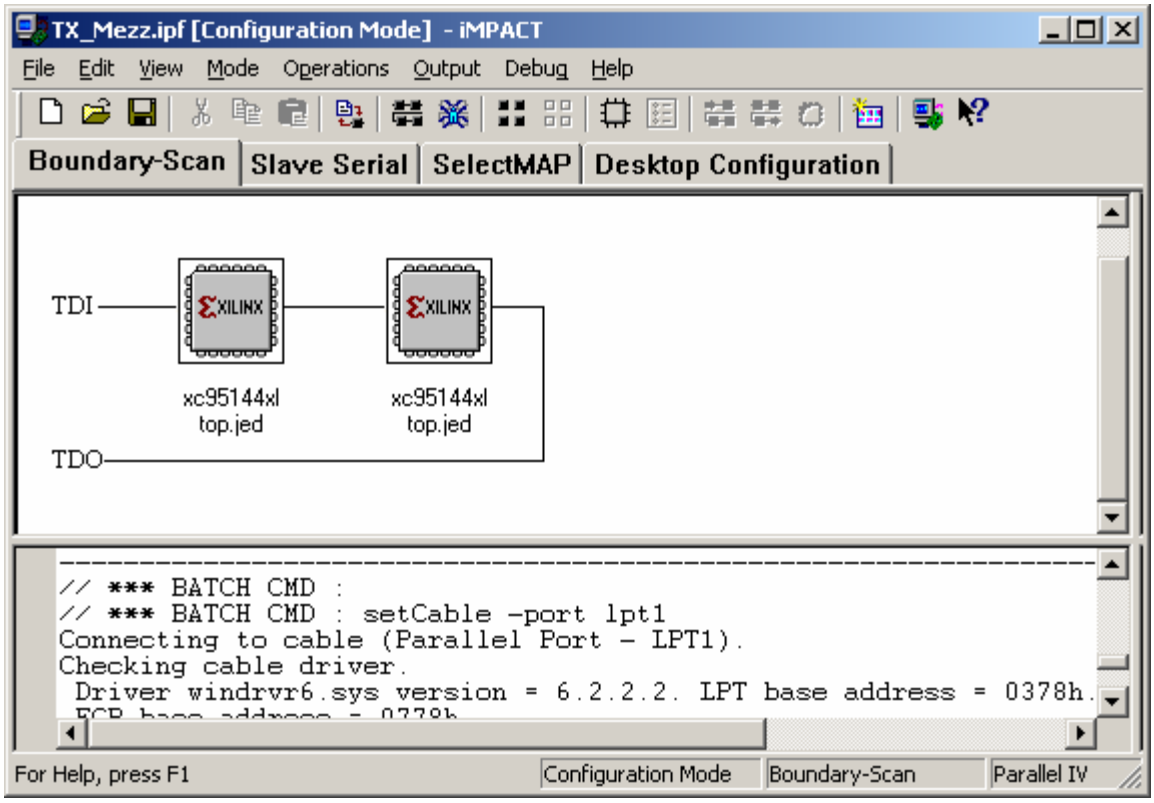
The lower window will detail the progress. A Blue button will pop up when finished. Disable the power supply output and remove the power supply and programmer wires. Install a version label to the back of the board. I usually program about 5 boards at a time or program while the crate is booting. The RX board is now ready for testing using the Stereo Finder board and software routine.

TX Mezzanine board

Routine for programming the <u>TX Mezzanine</u> board:

The TX boards are programmed in a similar manner to the RX boards with the exception that the connector is labeled as J9. Connect the programmer and power supply in a

similar manner and invoke the XILINX Impact software. Load the programmer file TX_Mezz.ipf. The window should show two devices in the chain and a file associated with each. A screen shot of the programmer window for the TX design is shown below.

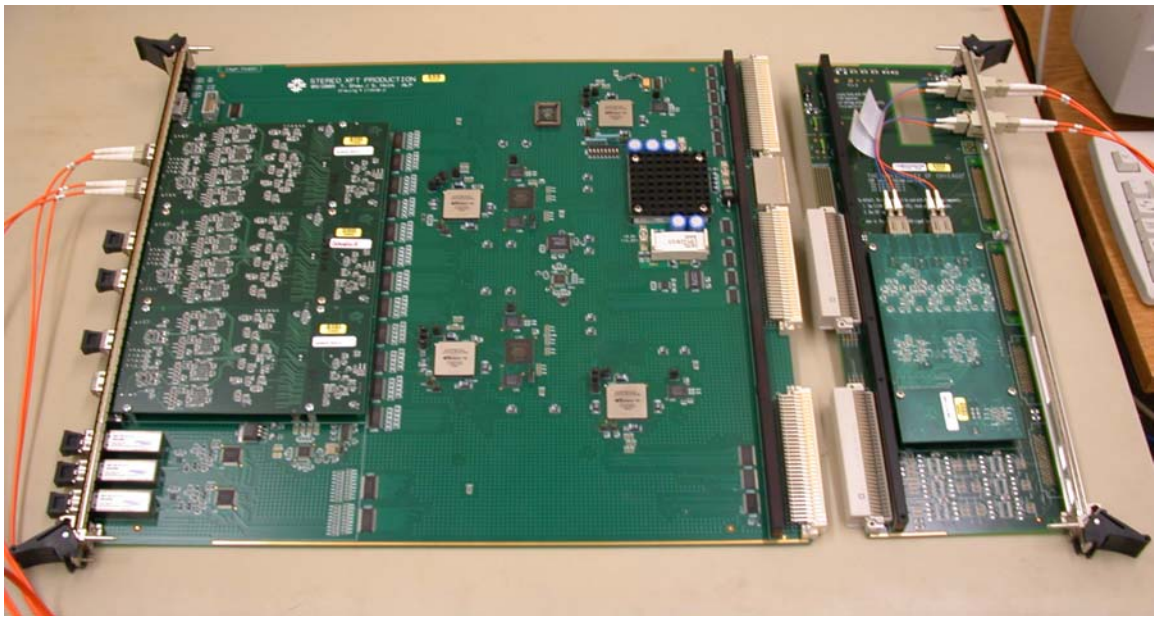


Enable the supply, select both devices and program them. A Blue button will pop up when finished. Remember to install the label with the version number.

Testing either the TX or RX boards:

After the boards have been assembled and programmed install the board to be tested into the correct location. For RX boards install it onto the Stereo Finder board in the top mezzanine board location. A TX mezzanine board should be located on a Transition module located in the back of the crate in the same slot location as the Stereo Finder board. Four fibers should be attached to the TX Mezzanine board and will attach to the RX board being tested. The top port of the transition board will connect to the top ports of the RX board. For testing a TX board, use a known good RX board on the Stereo Finder board in the top mezzanine board location. Replace the TX board on the transition module with the TX board that is going to be tested.

Caution should be taken when handling the fibers – don't look into the fiber or fiber driver if the board is powered! Also the crate should be powered down when any of the boards are removed or installed. The picture below shows the Stereo Finder board with three RX boards(only one is needed for testing), a transition module with a TX board and the fibers connected to the boards being used in the test.



The crate where the testing is being conducted will need a crate controller and a Testclock module that is configured to operate on it's own without a Tracer.

1. Plug in the TX or RX mezzanine board(UUT)
2. Attach 4 fibers to the TX or RX mezzanine board
3. Power up crate and wait for crate controller to finish booting(green LED labeled "BFL" on controller goes off)
4. Login to Linux box.
5. Open a terminal window. ">" means to type text
6. > cd test ! change to the test directory
7. > sxft_v3 ! screen will appear that ask for crate controller
8. *enter crate controller name*
9. *enter number of Stereo finder boards = 1*
10. *enter slot number of Stereo Finder board*
11. The main menu will appear – select 4 – "Advanced test menu".
12. The advanced test menu will appear – select 10 – "TX-RX mezzanine test".
13. A menu will appear asking for auxilary module information. Select 1 Testclock
14. Input Crate controller name and Testclock slot number.
15. Quit that menu – it will return you to the advanced test menu. Select 10 again.
16. The TX-RX test will be invoked – the screen will ask if you want to display errors. Type "y" for yes.
17. The test will then run until a Control C is typed. There should be 0 errors unless there is a problem with the TX or RX board under test.
18. After a minute stop the test with Control C and record the results.
19. Record the Serial numbers in the notebook
20. Power off the crate and remove the board being tested, if testing more than install the next board and power up the crate.
21. Put Rubber plugs back in optical connectors
22. Put back in anti static bag
23. Put the passed units in a box
24. Put the failures in a different box.